(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 April 2003 (10.04.2003)

PCT

(10) International Publication Number
WO 03/029985 A1

(51) International Patent Classification⁷: G06F 13/00

(21) International Application Number: PCT/DK01/00638

(22) International Filing Date: 3 October 2001 (03.10.2001)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **OLSEN, Frits** [DK/DK]; Ved Amagerport 3, 5.th., DK-2300 Copenhagen S. (DK).

(71) Applicants *(for all designated States except US)*: **KRISTENSEN, Jan, Erik** [DK/DK]; St. Kirkestraede 3, DK-4897 Oester Ulslev (DK). **ZIEGLER, Tina** [DK/DK]; Toftekrogen 14, Smoerumnedre, DK-2765 Smoerum (DK). **EINARSSON, Ari** [DK/DK]; Vestervigvej 7, 1., DK-2720 Vanloese (DK). **FREDERIKSEN, Bo, V.** [DK/DK]; Richardt Granholms Allé 4, DK-2720 Kastrup (DK).

(72) Inventor *(for US only)*: **OLSEN, Frits**; Ved Amagerport 3, 5.th., DK-2300 Copenhagen S. (DK).

(72) Inventor *(for all designated States except US)*: **CHRISTENSEN, Jesper**; Roedovre Parkvej 257 1.th., DK-2610 Roedovre (DK).

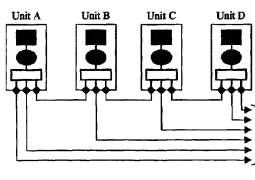
(74) Common Representative: **OLSEN, Frits**, Ved Amagerport 3. 5.th., DK-2300 Copenhagen S. (DK).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: SYSTEM WITH CASCADE COUPLED DISCS FOR INCREASED CAPACITY AND BACKUP



AND/OR

(57) Abstract: Through the network interface, on a computer, or in an ordinary network, you will gain access to a disc unit. This disc unit can, through a driver be mapped or mounted into your machine, or you can gain the access through your IP protocol using an ordinary Internet browser. The disc unit has tree major functions: 1. Disc unit. 2. Disc enlarger. 3. Disc backup. The unit is at the same time, capable of receiving offered functions from other disc units connected. The functions built in, within every single unit, are: disc unit used in a system, performing size enlargement of another disc unit, or automatically make backup of another disc unit. An IPDU will offer your Computer-system or Network more harddisk space. In addition to this it can accept additional IPDU's. In both cases the IPDU-system will ace as 1 disc. It is only inside the built-in configuration software, all individual IPDU's will be recognised/(identified). The built-in WEB server is accessible by a standard Internet Browser. It is very user-friendly with clear text and point-selections, for management of the system, or usage of FTP functions. All IPDU's are connected via their build in Ethernet-switch. This secures the connectivity. Every IPDU has its own IP-address and/or DNS name, the system is based on the IP-protocol. When doing the first time installation of an IPDU, it has the option to be configured for a static or dynamic IP-address. The operating IP-address or name is shown in the display located at the front of the IPDU. Any activity and current status on the disk will also be indicated there. In case of Power failure, the Power Supply will rest power enough to flush all cash information, and make a secure power down. In case of an IPDU-unit has to be replaced, all stored data will be accessible from other IPDU's having the backup-function, if such one is configured. Different IPDU sizes can function together, but in terms of backup function, the administrator has to ensure capacity enough in the backup disc area.

WO 03/029985 A1

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

Published:
— *with international search report*
— *with amended claims*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SYSTEM WITH CASCADE COUPLED DISCS FOR INCREASED CAPACITY AND BACKUP

Description

Designation

Internet Protocol Disc Unit

(Intelligent expandable, IP protocol network disk storage unit.)

The inventions utilise disputed

Extern Ethernet connected disc unit. Indefinitely expandable. Hot-swap technology, no need for downing system while upgrading. Usage as simple as building bricks. Simple, fully automatic, backup function included. Built in WEB and FTP support. Network connected unit, no server or controllers needed. Drivers available for the most popular operating systems and server based environments (WIN9x/ME/NT/Win2000/NetWare/Linux/...). Works in an active directory, server based environment as a server "driver". Mountable as a NFS volume in a UNIX/LINUX based environment.

The technical level of attainment

The today existing disk units which can offer linked disks, through that to offer higher / bigger capacity, is still living with those limitation as their link methods have, just like IDE with max. 4 units, which demand further software to work as one unit today.

The SCSI system however, works in the same way as IDE, but with today max 15 units.

Where our IPDU on the other hand, demand no controller, neither, an independent PC or software to be linked together.

And with the total capacity, practically indefinitely (IP4: max. 4294967295 units, without bridge!)

The special systems, which offer raid functionality, demand units, which are identical, where the IPDU can carry out that with all kinds off units.

As supplement to that, the IPDU can work as an automatically backup, by one unit in its set up are made to "backup of xx xx xx xx with yy hours interval, never delete / delete".

As the IPDU is not demanding rack, controller or dedicated computer systems, the IPDU offer a linear investment, totally with out ceiling.

The special achievement of the invention

The IPDU can hereby, fully meet the conditions there are today for storage of the continuously expanding data carrier store, with in the private, business and Internet solutions. The IPDU is in addition offering a security which far out exceeds the today known methods for backup, as it is up to the user to decide how many layers of backup he wishes.

The new technical means

One unit with its own PSU, hard disc, processor, and tree Ethernet ports.

The processors flash memory contains code for all necessary functions, to simultaneous functionality of listed functions:

1) Ethernet switch for all 3 ports,
2) Controlling the disc unit,
3) FTP Server,
4) WEB Server,
5) SNMP manager,
6) IP protocol with build in data package engine adding the functionality of:

7) The unit can offer its disk space to an computer driver or ---
8) The unit can offer its disk space to another unit or ---
9) The unit can offer its disk space to backup another units data.
10) At the same time, the unit is capable of receiving, and add, the offered functions to its own, and offer even larger disk space forward in the system.

Diagram description

Fig.1 Signatures
Fig.2 Basic (minimum) system
Fig.3 2 IPDU's for larger capacity, or backup function
Fig.4 3 IPDU's for larger capacity, and/or backup function
Fig.5 4 IPDU's system example
Fig.6 5 IPDU's system example

For figures 5 and 6, any combination of statements in listed four lines is valid, as long as one unit has only one assignment, and avoiding cyclic usage (a backup b, and b backup a !!!!)

A can be visible disc in system or disk-expander for B or C or D or backup for B or C or D
B can be visible disc in system or disk-expander for A or C or D or backup for A or C or D
C can be visible disc in system or disk-expander for A or B or D or backup for A or B or D
D can be visible disc in system or disk-expander for A or B or C or backup for A or B or C

Some practical examples of above (in conjunction with Fig.5 and/or Fig.6)

Practical example 1:

A is the disk seen in the network as a computer drive and
B is disk expander for A, (A is then seen as "bigger" volume)
C is mirror (backup, with delay 0!) for A
D is disk expander for C, then C has capacity to be valid backup of A

Practical example 2:

A is the disk seen in the network as a computer drive and
D is backup of A
C is the disk seen in the network as a computer drive and
B is backup of D (A has then double backup)

Practical example 3:

B is the disk seen in the network as a computer drive and
A is disk expander for B
D is disk expander for A
C is disk expander for B
(B is then four times the original volume!)

Claims of patent

1. The patent covers that, one disk-unit can offer additional functions and capacity to another disk-unit.

2. Characterised by build in functionality for automatic cascade coupling, giving possibility for, increase of capacity and automatic backup.

AMENDED CLAIMS

[received by the International Bureau on 23 August 2002 (23.08.02);
original claims 1-2 replaced by new claims 1-2]

1. The inventive part in the IPDU is that, apart from being a network disk unit, it can offer one out of two services to a specified IPDU unit. The communication between the units works across a network.

In addition to that, the IPDU can, at the same time it delivers its service; receive services offered by other IPDU's, adding them to it's own configured service.

The invention includes all necessary hardware and software in one single unit. Therefor one or more IPDU's works without external controllers or any other additional software.

2. The two mentioned services an IPDU can offer to another IPDU are capacity extension and automatic backup.

The two mentioned services an IPDU can receive, simultaneously, are other IPDU's capacity extension and automatic backup.

Therefor - as a result of this - an IPDU works as a network attached extra harddisk, but with the capacity that equals the sum of all offered capacities from other involved IPDU's.

The invention also covers that a number of such systems, or collections of IPDU's, are able to work independently.

Fig.1

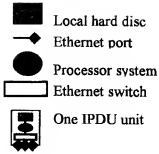


Fig.2

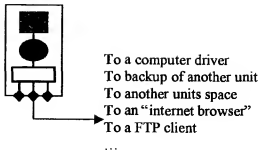


Fig.3

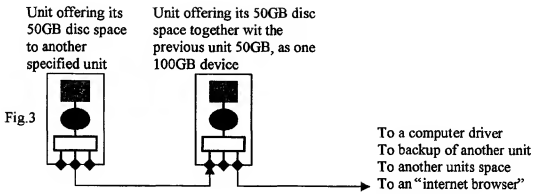


Fig.4

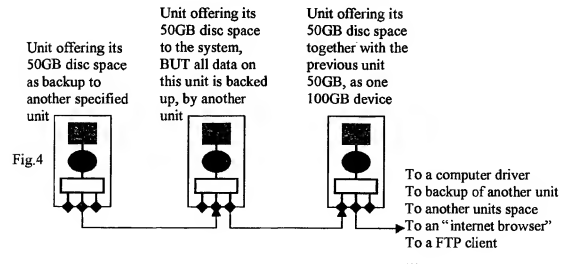
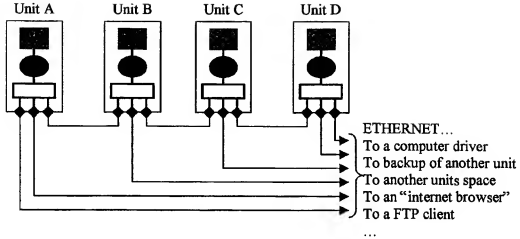
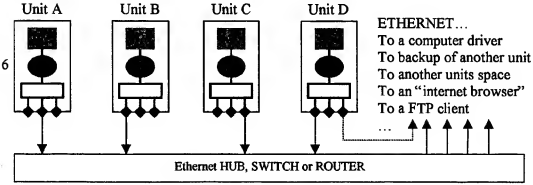


Fig.5



AND/OR

Fig.6



INTERNATIONAL SEARCH REPORT

Inte.....onal application No.
PCT/DK 01/00638

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 13/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	AXMAN et al.: RAID. In: 64bits, 24 October 2000. Retrieved on 2002-05-06 from the Internet: http://www.64bits.se/guider/raid/index.shtml See pages 1-2 -- --------	1,2

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 May 2002	14 -05- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Oskar Pihlgren/LR Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)